



**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Application of: / Confirmation No.: 1924  
 Babel et al. /  
 /  
 Serial No: 10/658,598 / Group Art Unit: 1742  
 /  
 Filed: 9/8/2003 / Examiner: George Wyszomierski  
 /  
 For: LARGE DIAMETER DOMES AND / Customer No.: 33197  
 METHODS OF MANUFACTURING /  
 SAME /

Commissioner for Patents  
 P.O. Box 1450  
 Alexandria, VA 22313-1450

**APPELLANT'S BRIEF (37 CFR §41.37)**

Sir:

This brief is in furtherance of the Notice of Appeal filed in this case on October 24, 2005. A transmittal letter, including a Certificate of Mailing, accompanies this brief.

***REAL PARTY IN INTEREST (37 CFR §41.37(c)(1)(i))***

The assignee of record is the real party in interest.

***RELATED APPEALS AND INTERFERENCES (37 CFR §41.37(c)(1)(ii))***

There are no related appeals or interferences previously or currently pending.

***STATUS OF CLAIMS (37 CFR §41.37(c)(1)(iii))***

The application on appeal, as filed, contained 12 claims, of which claim 1 was independent. Claims 13-16 have been subsequently added by amendment, of which claims 13 and 16 were independent. Presently, claims 1-9 and 11-16 stand rejected, having been finally rejected on July 20, 2005. No claims stand allowed. Thus, the status of the claims is as follows:

canceled claims -- 10  
allowed claims -- None  
claims objected to -- None  
claims rejected -- 1-9 and 11-16  
claims withdrawn -- None

**The claims on appeal are Claims 1-9 and 11-16.**

***STATUS OF AMENDMENTS (37 CFR §41.37(c)(1)(iv))***

An amendment was filed on June 3, 2005, which was entered. No other amendments have been filed or entered. The foregoing section listing the present status of the claims takes into account all amendments of record.

***SUMMARY OF CLAIMED SUBJECT MATTER (37 CFR §41.37(c)(1)(v))***

The subject matter of the claims comprises an economical method of making spin blanks greater than a predetermined size, which is, in a preferred embodiment, greater than 156 inches in diameter for plate and 139 inches in width for sheet material. In Fig. 2A, there is shown a circular blank 40 suitable for spinning into a dome and consisting of two semi-circular aluminum plates 42a, 42b joined along their juxtaposed radial edges. In the claimed method, the two plates are friction stir welded together along the abutting edges to form the blank 40. The blank is then spin formed into a dome. The spin forming step comprising clamping the blank, applying heat thereto, and rotating the blank while applying pressure to selected regions thereof using a suitable tool. In Fig. 2B, there is

shown an alternative arrangement comprising a square blank 50 consisting of four square aluminum plates 52a, 52b, 52c, and 52d, each connected along two side edges to two other plates with two of the illustrated friction stir welded joint lines 54a, 54b, 54c, 54d. A circular outline 56 of a blank suitable for spinning into a dome is shown, which blank may be cut out of the larger square blank 50.

Optionally, the circular disk blank may also be stretched as it is spun to increase its size.

The solid state joint provided by the inventive process is free of defects when the correct processing conditions are used, with exceptionally fine grains in the stirred nugget. This essentially eliminates the potential for cracks or tearing of the material during the spinning and/or stretching steps with no greater risk than a one-piece homogenous blank. One specific heat treatment for Al 2219 plates friction stir welded together includes friction stir welding of as-rolled plate (F temper), annealing the blank per standard procedures, spinning (and optionally stretching) the blank per standard procedures, and solution heat treatment and aging per standard procedures.

For the convenient reference of the Board, a copy of the claims on appeal is presented in Appendix A, and a copy of appealed claim 1, modified to include representative reference numerals, is presented in Appendix B.

***GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL (37 CFR  
§41.37(c)(1)(vi))***

Claims 1-9 and 11-16 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Japanese Reference No. 2001-001059 in view of Shrayer et al. (Patent No. 6,199,419).

***ARGUMENT (37 CFR §41.37(c)(1)(vii))***

The Examiner rejected claims 1-9 and 11-16 under 35 U.S.C. 103(a) as being

unpatentable over Japanese Reference No. 2001-001059 (JP '059) in view of Shrayer et al. Patent No. 6,199,419 (Shrayer et al. '419). The final rejection of July 20, 2005 stated that the JP '059 reference discloses friction stir welding of several aluminum sheets to form a flat plate, followed by a step of pressing or drawing to produce a parabolic shaped material. The Examiner acknowledged that the JP '059 reference does not disclose the spin-forming step, and the various "sub-steps" recited in Claim 1, and does not disclose annealing prior to spin forming as required by claims 6, 8, and 13-15, or friction stir welding of pieces that are in an annealed condition as defined in claims 9 and 16.

However, the Examiner asserts that the Shrayer et al. '419 patent indicates that it was known in the art, at the time of the invention, to form dome-shaped articles from a flat blank by spin forming, and further discloses the "sub-steps" recited in Claim 1. The Examiner further asserts, with respect to Claim 6, that the Shrayer et al. '419 patent further discloses that it was well known in the art, at the time of the invention, to anneal aluminum alloy blanks prior to spinning

Appellants respectfully traverses the Examiner's rejection of the referenced claims. The JP '059 reference merely discloses the prior art already acknowledged by Appellants in the present application, which is friction stir welding of two fully heat treated aluminum plates, following which the resultant "wide flat plate" 23 is drawn into a parabolic shape for use as a parabolic antenna mirror surface plate. The drawing step is discussed in paragraph [0017] of the '059 reference, and is shown in Fig. 5 of the JP '059 reference. See the instant specification, page 3, lines 17-25, for a discussion of friction stir welding, as known in the art, and the fact that it is only known in connection with fully heat-treated aluminum alloys. On the other hand, spin forming, as known in the art, is only known for forming parts which are in the annealed temper (page 3, line 25 of the instant specification). The Shrayer patent merely teaches this feature, already also acknowledged by Appellants in the present specification. It was the present inventors who determined that spun-form parts, in the annealed temper, could then be friction stir welded, as claimed, in that temper, without first being fully heat treated, as was standard prior art practice.

Independent claim 1 recites a method of making spin blanks greater than a

predetermined size, which comprises providing at least two pieces of material having abutting edges, friction stir welding the two pieces together along the abutting edges to form a blank, and spin forming the blank into a desired article, wherein the spin forming step comprises clamping the blank, applying heat thereto, and rotating the blank while applying pressure to selected regions thereof using a tool. As the Examiner admits, the '059 reference does not disclose spin forming, but rather a drawing step. A significant difference between the two is that drawing is routinely performed on a fully heat treated plate, as is the case for the JP '059 reference, whereas spin forming is typically only performed on annealed plates (having a soft temper), as discussed above. Spin forming cannot be used to form a parabolic antenna mirror surface of the type disclosed in the JP '059 reference. Moreover, it would not have been obvious to spin form, rather than draw, the JP '059 product, because it is fully heat treated and not suitable for spin-forming.

While the Shrayer et al. '419 patent discloses a conventional process for manufacturing a dome by spin forming said dome, as discussed in the present specification at page 1, line 17 through page 2, line 21, there would have been no motivation present in the prior art to apply the teachings of the Shrayer et al. '419 patent to the JP '059 disclosure to arrive at the claimed invention, absent reference to the present disclosure. The reason is simple. The drawing process disclosed in the JP '059 reference requires a fully heat treated aluminum plate. In contrast, the Shrayer et al. '419 patent discloses a method of spin forming an annealed plate. To substitute the spin forming step of the Shrayer et al. '419 patent for the drawing step of the JP '059 reference would have been unobvious because spin forming requires an annealed (softer) rather than fully heat treated, or finished, aluminum plate. Moreover, such a spin forming step is unsuitable to the fabrication of a mirror, as taught by the JP '059 reference. Thus, one ordinarily skilled in the art would never have made such a combination, based on the teachings of the two references at issue.

The Examiner avoids this problem with his reference combination by failing to make his *prima facie* case for obviousness. He never explains how it would have been obvious to combine the Shrayer et al. '419 patent and the JP '059 reference disclosures. He further states that the distinction made between fully heat treated and annealed

materials "is not persuasive of patentability because while the statements in the specification may reflect the present applicant's knowledge, such statements cannot be held to encompass all knowledge of practitioners in the aluminum processing art".

This statement is legally incorrect, and legally inconsequential, even if it were true, because the Examiner has made no effort whatsoever to ascertain, and place in the record, the state of knowledge of practitioners in the aluminum processing art, and certainly has not placed in the record any evidence contradicting Appellant's description of the prior art as set forth in the specification. Under the test of *Graham v. John Deere*, it is incumbent upon the Examiner to make a *prima facie* case of obviousness for the proposed reference combination. This means that the Examiner must present a threshold level of evidence to support his contention that it would have been obvious to apply the teachings of the Shrayer et al. '419 patent to modify the process taught by the JP '059 reference. In contrast, the Examiner has offered no evidence of obviousness related to the combination of references to meet the claimed rejection. Rather, he attempts to force the Appellants to prove that the prior art does not teach the claimed invention, by merely stating that Appellants have not provided evidence of the knowledge of all practitioners in the aluminum processing art. Appellants have rebutted, with a well reasoned and supported position, the Examiner's unsupported statement that it would have been obvious to combine the teachings of Shrayer et al. '419 patent and the JP '059 reference to obviate the claims. In response, the Examiner offers nothing other than a statement that Appellants have not proven the entire state of prior art knowledge. Obviously, this is an unacceptable and untenable position. It is up to the Examiner to supply evidence to support his contention that the state of the prior art is different than asserted by Appellants. *See Ex Parte Wolters and Kuypers*, 214 U.S.P.Q. 735 (Bd. of Appeals 1979), and *Ex Parte Gerlack and Woerner*, 212 U.S.P.Q. 471 (Bd. of Appeals 1980) (there is nothing in the statutes or the case law which makes "that which is within the capabilities of one skilled in the art" synonymous with obviousness). Thus, claim 1 is clearly patentable over the prior art of record.

In the Advisory Action mailed on October 4, 2005, the Examiner attempted to buttress his case by claiming that the referenced annealing step is indefinite. He cited

an ASM Materials Engineering Dictionary for a definition of "annealing". Appellants do not dispute the cited definition. However, the term is well known in the prior art in connection with aluminum alloys of the type discussed in the present application. In this context, clearly described and supported in the present specification, the annealing step is for the purpose of re-crystallizing, and thus softening, the material so that it is in suitable condition for spin-forming. Appellants have not invented anything new in the area of heat treatment of metals. The annealing step, prior to spin-forming, and subsequent heat treating (hardening) steps, disclosed and claimed in the present application are similar to those disclosed in the Shrayer et al. '419 patent (see, for example, col. 4, line 60 through col. 5, line 54, and claim 6 for discussion of annealing steps and col. 6, line 45 through col. 7, line 13 for discussion of final heat treatment/finishing steps), which has been expressly incorporated by reference into the present application (page 2, line 26 through page 3, line 1 of the present specification).

It is noted, in the English translation of the JP '059 reference made of record earlier in the prosecution of this application, in paragraph [0019] that no finishing (work-hardening) of the joint 22 is performed after the drawing or pressing step, to avoid cracking. This is said to avoid the need for mirror surface modification. In paragraphs [0020] and [0021], it is repeated that an important feature of the invention is that there is no need to apply any finishing steps once the mirror has been formed. Since optical mirrors are precise instruments, this is an important advantage of the process disclosed by the JP '059 reference. Accordingly, it is abundantly clear that there would have been no motivation for applying the teachings of the Shrayer et al. '419 patent to the JP '059 reference, as such an application would have destroyed the advantages of the JP '059 process.

Claims 2-5, 7, and 11-12 are dependent upon claim 1, and are therefore patentable over the prior art as well. Claim 6 further recites a step of annealing the blank after friction stir welding, prior to the spin forming step. It would not have been obvious to modify the JP '059 reference to include the recited annealing step, even in view of the Shrayer et al. '419 patent, because the drawing or pressing step disclosed by the JP '059 reference is not performed on annealed metal, but rather only to fully heat treated metal,

so that a finished product results, which does not require further processing after the reflector has been formed, as discussed above. Thus, claim 6 is clearly patentable over the prior art of record.

Claim 8 is dependent upon allowable claim 7 and further recites that the blank is annealed after friction stir welding and prior to the spin forming step. Clearly, this step is patentable over the combination of JP '059 reference and the Shrayer et al. '419 patent proposed by the Examiner, for the reasons discussed above in connection with claim 6.

Claim 9 is dependent upon allowable claim 1, and further recites that the material pieces are friction stir welded in an annealed temper. This claim is allowable over the prior art, for reasons already discussed above. The Examiner makes a strange argument, in reference to claims 9 and 16, that "the instant claims do not positively recite an annealing step but merely allude to one, i.e. material is processed that is in an annealed temper or condition." He further states, immediately thereafter, that "[i]t is not possible to determine, in any of the prior art references, all of the possible treatments (including annealing) that the materials processed therein may or may not have been subjected to. Nonetheless, the process of JP '059 or Shrayer (sic) would be applicable to being applied to annealed aluminum materials".

It is not at all clear what point the Examiner is making in this statement. The claim language is abundantly clear, in both claim 9, wherein it is recited that the "material pieces are friction stir welded in an annealed temper", and in claim 16, wherein it is recited that material is provided "in an annealed condition". These are real, positive, limitations, despite the Examiner's erroneous statement to the contrary, and cannot be ignored or minimized by the Examiner because it is hard to ascertain the teachings of the prior art. The law does not provide an Examiner a pass because he cannot determine what the prior art teaches. Moreover, he is not free to blithely assume that "the processes of JP '059 or Shrayer (sic) would be applicable to being applied to annealed aluminum materials", unless that is what one of ordinary skill in the art would perceive from the teachings of those references, and his knowledge of other prior art. In fact, as we have already discussed, the Shrayer et al. '419 patent does teach the friction stir welding of annealed material, explicitly. However, the JP '059 reference is concerned with forming

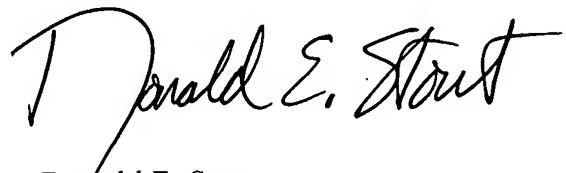
a hardened parabolic mirror, which does not require finishing steps after the drawing step. As has already been discussed, spin forming this type of product would not be appropriate, because of the requirement that spin forming be done only in connection with softer materials, unsuitable to the manufacture of such a parabolic mirror, and, therefore, the Examiner's bald assertion with respect to the JP '059 reference that it would be applicable to annealed materials is unsupported and clearly incorrect. It is based entirely on an inappropriate reliance on hindsight reasoning, after reference to Appellants' own teachings. Thus, claim 9 is clearly patentable, for this additional reason.

Independent claim 13 is similar in many respects to claim 1, but specifically recites a step of annealing the blank after it has been friction stir welded and before the spin forming step. Clearly, this claim is patentable over the JP '059 reference, in combination with the Shrayer et al. '419 patent, for the reasons discussed above in connection with claims 1-9 and 11-12. Claims 14 and 15 depend upon allowable claim 13, and are clearly patentable as well.

Independent claim 16 recites a friction stir welding step which involves a material in an annealed condition, as was discussed above, in connection with claim 9. This claim, as well, is patentable, for the reasons discussed in connection with claims 1 and 9.

For all of the foregoing reasons, the rejection of claims 1-9 and 11-16 under 35 U.S.C. 103(a) as being unpatentable over Japanese Reference No. 2001-001059 in view of Shrayer et al. (Patent No. 6,199,419) is clearly improper, and should be reversed.

Respectfully submitted,



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***APPENDIX A (37 CFR 1.192 (c)(7))***

The text of the claims on appeal are:

1. An economical method of making spin blanks greater than a predetermined size, comprising:

providing at least two pieces of material having abutting edges;

friction stir welding the two pieces together along the abutting edges to form a blank; and

spin forming the blank into a desired article, the spin forming step comprising clamping the blank, applying heat thereto, and rotating the blank while applying pressure to selected regions thereof using a tool.

2. The method as recited in Claim 1, wherein any number and size of material pieces are joined by friction stir welding to provide the required blank size.

3. The method as recited in Claim 1, wherein the material pieces are an aluminum alloy.

4. The method as recited in Claim 3, wherein the material pieces comprise sheet having a thickness of 0.030 inches (0.762 mm) or greater.

5. The method as recited in Claim 3, wherein the material pieces comprise plate having a thickness of 0.250 inches or greater to a maximum thickness that can be friction stir welded.

6. The method as recited in Claim 1, wherein the blank is annealed after friction stir welding, prior to the spin forming step.

7. The method as recited in Claim 1, wherein the material pieces are friction stir welded in any heat treat condition to a maximum size of available annealing ovens that will accommodate a circular blank.

8. The method as recited in Claim 7, wherein the blank is annealed after friction stir welding and prior to the spin forming step.

9. The method as recited in Claim 1, wherein the material pieces are friction stir welded in an annealed temper, to form said blank with a joint therein, and the spin forming step is performed with the joint in the as-welded condition.

10. (Canceled)

11. The method as recited in Claim 1, wherein said at least two pieces comprise plates, and said blank has a diameter greater than 209 inches.

12. The method as recited in Claim 1, wherein said at least two pieces comprise sheets, and said blank has a width greater than 139 inches.

13. An economical method of making spin blanks greater than a predetermined size, comprising:

providing at least two pieces of material having abutting edges;

friction stir welding the two pieces together along the abutting edges to form a blank;

annealing the blank; and

spin forming the blank into a desired article.

14. The method as recited in Claim 13, wherein the friction stir welding step is performed with the material in a fully heat treated condition.

15. The method as recited in Claim 13, wherein the friction stir welding step is performed with the material in an as-rolled condition.

16. An economical method of making spin blanks greater than a predetermined size, comprising:

providing at least two pieces of material having abutting edges, said material being in an annealed condition;

friction stir welding the two pieces together along the abutting edges to form a blank; and

spin forming the blank into a desired article.

***APPENDIX B***

For convenience, a copy of representative claim 1 on appeal, including reference numerals drawn from the figures, is presented below. It is to be understood, however, that this presentation is solely for the convenience of the members of the Board of Appeals, as suggested in the *Notice of May 3, 1988* (1092 O.G. 26-35), and that the claims are not to be limited thereby, but rather to be construed solely in light of the disclosure. Furthermore, the reference numerals are merely representative, in that the numerals from other various embodiments could be substituted in their stead.

1. An economical method of making spin blanks (40, 50) greater than a predetermined size, comprising:

providing at least two pieces of material (42a, 42b, 52a, 52b, 52c, 52d) having abutting edges;

friction stir welding the two pieces together along the abutting edges to form a blank; and

spin forming the blank into a desired article, the spin forming step comprising clamping the blank, applying heat thereto, and rotating the blank while applying pressure to selected regions thereof using a tool.

***APPENDIX C – Evidence Appendix***

No evidence, apart from the file history of the subject application and any evidence entered during the prosecution of said application before the Examiner, has been entered and relied upon in this appeal.

***APPENDIX D – Related Proceedings Appendix***

As noted on page 1 of this appeal brief, there are no related proceedings respective to the subject application.